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Interest Rate Smoothing and Macroeconomic Instability under Post-Capital Account Liberalization Turkey

We study how the interest rate policy of the Central Bank of the Republic of Turkey (CBRT) has evolved under the post-financial liberalization and deregulation era. Utilizing econometric methods on a generalized form of a Taylor Rule we search for the possible revelation of a variety of determinants of monetary policy with different objectives over 1994-2007. We find that over such an extended time horizon during which significant shifts in the macroeconomic environment have occurred, the CBRT's almost exclusive focus on "interest rate smoothing" has not changed; and that the CBRT has not paid any attention to developments in national income.

This raises the question whether there is a deeper underlying structural constraint, binding the CBRT's alleged "independence". We trace the basics of this deep structural constraint to the nature of the global financial system restricting the ability of the central banks to pursue "independent" policy objectives.

I. Introduction: From Inflation Targeting to Interest Rate Smoothing

The art of modern central banking has gone through profound changes over the last two decades. After long, and at times futile, debates on the specification of the macro aggregate that is to be targeted, or on the optimality characteristics of the so-called "objective functions", the 1990s had witnessed a new sanctimony, dubbed as "inflation targeting" (IT).[1] More properly ought to be referred as "inflation forecast targeting", the approach was initially announced in New Zealand as a set of policy guidelines to help reduce the markets' uncertainties in a volatile global market. With the accumulated experiences of the crises in East Asia in 1997, Russia and Brazil in 1998, and Turkey and Argentina in 2001, such perceptions were further finessed and evolved into new concepts such as "institutional and instrument independence", "credibility", "expectations management", and "transparency".

[1] In broad terms, the IT policy framework involves "the public announcement of inflation targets, coupled with a credible and accountable commitment on the part of government policy authorities to the achievement of these targets" (Setterfield, 2006: 653). In addition, inflation targeting is usually associated with appropriate changes in the central bank law that enhances the independence of the institution (Bernanke, et. al. 1999, p.102; Mishkin and Schmidt-Hebbel, 2001, p.8. See also Buiter, 2006 for an evaluation). For a recent assessment of the inflation targeting regimes, see Epstein and Yeldan (2008) and the special issues in the *Journal of Post Keynesian Economics* (2006) and *International Review of Applied Economics* (2008: 22/2).

As the IT framework deepened and elevated to the status of the new norm of global orthodoxy, new institutional mechanisms were also devised such as establishing a "monetary policy board" with a pre-announced meeting calendar, and open public display of the board's meetings along with the disclosure of voting behavior of its members to "facilitate transparency" of the bank's intentions. In this vein, many developing countries have changed their central bank laws in order to decrease the influence of democratically elected governments on central banks (CBs).

Along this trend, the orthodox approach has continued to exclusively emphasize indirect, market based instruments, such as short term interest rates, as the primary tool of monetary policy. (Masson, et. al., 1997).[2] Given this exclusive focus on price stability via interest rate responses, however, there had been a concomitant common observation that historical responses of the nominal interest rates to shocks had been significantly more *gradual* and *sticky* than the *optimal* policies called for by the efficiency rules. To account for this fact, some authors noted a revealed desire on the part of the IT-central banks to *smooth* their rates of interest over and beyond the generally stated objective of achieving price stability.[3]

Thus, the aforementioned desire for *interest rate smoothing* has gradually surfaced out as the main underlying motive of the modern CBs under the age of financial globalization. Consequently, in an attempt to secure investor confidence and credibility, the CBs came to be increasingly constrained to maintain a high and constant rate of interest in their operations. It is the purpose of this paper to document evidence to this fact from a newly "emerging market economy", Turkey.

Turkey's recent macroeconomic history provides an interesting case study in the IT literature with its prolonged experience of persistent, inertial and moderately high rates of inflation (at around a plateau of 60-70% per annum) and highly volatile cyclical boom-bust growth episodes. Turkey has completed its capital account deregulation in 1989, and in the

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[2] Note, for instance, the *Bank of England*'s policy mandate: "One of the Bank of England's two core purposes is monetary stability (the "other" core purpose is financial stability –authors' note). Monetary stability means stable prices —low inflation- and confidence in the currency. Stable prices are defined by the Government's inflation target, which the *Bank seeks to meet through the decisions on interest rates* taken by the Monetary Policy Committee. (*www.bankofengland.co.uk*). (*Emphases* ours).

[3] See, *e.g.*, Srour (2001); Lowe and Ellis (1998), Sack (1998a, 1998b) Drew and Plentier (2000), Mehra (2001), Benhabib and Uribe (2003), and Woodford (2002) for a detailed analysis of measuring the interest rate smoothing. In its most succinct form, the argument is that monetary authorities are assumed to minimize a loss function of the form: $\beta_1 var(y_t) + \beta_2 var(P_t) + \beta_3 var(i_t - i_{t-1})$ where y_t is real output; P_t is the price level; and i_t is the interest rate instrument. *Var(.)* denotes the variance of the associated variables, and β_1, β_2, β_3 are positive coefficients.

relatively short time span since then it had experienced no less than three major economic crises. The latest of these had erupted in early 2001, during when Turkey was following an IMF-led disinflation programme. The announcement of *independence* of the Central Bank of the Republic of Turkey (CBRT) came shortly after in that year. The CBRT announced immediately in October of 2001 that it would follow an *implicit/disguised* inflation targeting rule until conditions were ready for full targeting, which it declared so officially in January 1, 2006.

In what follows, in this paper we seek to provide evidence to the following questions: *How did the CBRT's policy objectives and strategic instruments evolve since the onset of capital account liberalization? What were the main determinants of the Bank's interest rates?* In particular, *has IT changed the responsiveness of the CBRT to different macroeconomic indicators?*

To this end, we utilize a central bank reaction function framework which, in some ways, can be seen as an expanded *Taylor Rule* regression, over 1994-2007. Here our aim is not to reveal the CBRT's official monetary policy rules *per se*, but rather to document in an *ex post* sense the behavior of the CBRT under its official guidelines and responses against the conditionalities imposed by the international finance community. We find that over such an extended time horizon during when significant shifts in the macroeconomic environment have occurred, the CBRT's almost exclusive focus on "*interest rate smoothing*" has not changed; and that CBRT has not shown any response to swings in the business cycles. This raises the question whether there is a deeper underlying structural constraint, binding the CBRT's alleged "instrument-independence" in its conduct of monetary policy. We trace the basics of this structural constraint to the nature of the global financial system restricting the ability of the central banks to pursue "independent" policy objectives.

The remaining pages of the paper are organized in four additional sections. Next, we provide a brief overview of the literature on interest rate smoothing to be followed by a short monetary history of Turkey since full capital account liberalization. We implement our econometric estimations in section four. Finally section five summarizes and concludes.

II: Empirical Evidence on Interest Rate Smoothing

There is now a significant body of accumulated empirical evidence suggesting that CBs tend to change their policy interest rates only gradually; and that, they reveal even greater reluctance to

initiate reversals. It was argued by Lowe and Elis as early as 1998 that the interest rate smoothing strategy has been an important part of central banks policies in the US, Japan and Germany. Goodhart (1998) documents similar results in France, Italy, Canada, Spain, Netherlands, Belgium and Australia. In this regard, Srour (2001) cites further evidence from the monetary history of twelve industrialized economies where the CBs respond gradually to economic shocks, moving their interest rate in relatively small discrete steps in the same direction. Based on time series econometrics, Srour's results indicate that there is a sustained divergence between the historically realized responses of nominal interest rates and the *optimal* responses as suggested by the conventional loss functions.[4] Some economists even try to find *optimum* interest rate smoothing rules (Woodford 2002). Some claim interest rate smoothing can decrease the volatility and contribute to stability under certain conditions (Benhabib and Uribe, 2003). In this vein, Woodford (2002:2) claims that "a concern with interest rate smoothing on the part of a central bank can have desirable consequences. This is because such an objective can result in history-dependent central bank behavior which, when anticipated by the private sector, can serve the bank's stabilization objectives through the effects upon current outcomes of anticipated future policy." In contrast, however, one might also argue that in many cases it can also be interpreted as an indication of "constrained/passive" central banking. This would be the case especially if other economic variables are not claimed significant in explaining movements in the central banks' interest rates.

Several theoretical explanations had been advanced to account for this phenomenon. The first is based on arguments of attaining and maintaining "credibility" in an uncertain and often hostile world of international finance. Monetary authorities often find it more effective to commit to a given level of its main instrument —the interest rate over extended periods of time rather than creating the image that "they are lost in the dark".[5] Third, the threat of capital flight in an uncertain domain warrants the CBs to follow "predictable" rules. In order to reduce the risks associated with increased financialization (See, among others, Crotty, 2005; Epstein, 2005; Stiglitz, 2000 and 2002; Grabel, 1995), the CBs are often committed to follow simple and well-

[4] Similarly, Drew and Plentier (2003: 3) argues that "in general terms models that are typically used by researchers … normally suggest fairly rapid and aggressive responses of short term interest rates, even under a flexible approach".

[5] From a different perspective, Caplin and Leahy (1996) advance a similar motivation. They argue that policymakers do not like frequent and sudden interest rate changes because they do not want to give an impression that they are poorly informed.

defined rules in the name of accountability and transparency.[6] Fearing that they would lose credibility, the CBs often prefer to follow smooth interest rate paths, even if "optimality rules" from their econometric models suggest otherwise. Related with this is the relevant concern for avoiding financial instability. The CBs are conditioned by the markets to avoid frequent variations in its instruments that would cause large swings in asset prices and the financial rates of return. Such swings could cause insolvencies in public debt and might have a severe negative impact in the corporate balance sheets. For instance, Cukierman (1996) argues that this is a very important factor behind the Fed's interest rate smoothing strategy. Third, but not the least, the existing uncertainty can force central banks to adjust their interest rates gradually. There are different types of uncertainties, which can be used to explain interest rate smoothing phenomena. Central banks are uncertain about the impacts of their tools on their economies (known as *parametric uncertainty* in the literature); the state of their economies (known as *modeling uncertainty*); the reliability of existing data (*data uncertainty*), and the characteristic and magnitude of future shocks. Johnson (2005) for instance shows that "data uncertainty" may play an important role in interest rate smoothing. Similarly, by using a VAR model Sack (1998a) argues that a significant part of interest rate smoothing can be attributed to "parameter uncertainty".[7]

In general, as the former US Fed Chairman, Alan Greenspan (2003:1) claimed, "uncertainty is not just an important feature of the monetary policy landscape; it is the defining characteristic of that landscape". Thus, under the impact of uncertainty, interest rate smoothing may be desirable for central banks because, in the words of Srour's (2001:2) illuminating description, "it is better to get more acquainted with the road conditions, and the manner in which the car responds during a rainstorm, before stepping on the accelerator or the brakes". [8]

In our view, the origins of all these ideas have much to do with increased financialization of the world economy and intensified pressures for capital deregulation.[9] "*End the financial*

[6] A 2007 study by *JP Morgan* states, for instance, that "the incremental gain of credibility from central banks' efforts to increase dialogue and accountability is minimal. What really matters in the current conjuncture is maintaining clear and predictable rules for interest rates". *JP Morgan, Daily Report*, 14 May 2007.

[7] See Conway (2000) and Greenspan (2003), discussion of the impacts of uncertainty on central banking from a qualitative perspective.

[8] One of the earliest discussion about the desirability of being cautious about monetary policy under uncertainty can be found in Brainard (1967).

[9] *Financialization*, as it stands, is a loose term and no consensus yet exists among economists on its definition. However, starting from David Harvey's seminal observation that "*something significant has changed in the way capitalism has been working since about 1970*" (Harvey, 1989), a set of distinguishing characteristics of the

repression!" were the battle cries of Mackinnon (1973) and Shaw (1973), trumpeting the elimination of all controls that inhibit free movement of capital across the globe and urging the national CBs to liberalize their credit markets by abandoning all interest ceilings. To this end, integration of the developing nation-economies into the evolving world financial system has been achieved through a series of policies aimed at liberalizing their financial sectors and privatizing major industries.

The neoliberal ideology attempted to explain the motives behind financial liberalization arguing that such measures would restore growth and stability by raising savings and improving economic efficiency. Accordingly, as the "strangulation" of financial repression is dismantled, loanable funds would expand; real cost of credit would fall; and the consequent increases in the pace of capital accumulation would generate sustained growth. This claim, referred to as the McKinnon-Shaw hypothesis, provided the theoretical backbone of the neo-liberal ideology advocating financial de-regulation and liberalization.

The real fact of life, however, has been quite a different story. Following full-fledged financial liberalization, those developing economies that underwent financial de-regulation found themselves trapped within high and persistent real interest rates. They also bore witness to a self-distorting foreign exchange market operating through attacks of speculative hot money flows into the fragile and shallow asset markets, luring the residents to over-zealous spending and excessive debt accumulation. Furthermore, contrary to expectations, the post-liberalization episodes were inflicted with the divergence of domestic savings away from fixed capital investments towards speculative financial instruments with often erratic and volatile yields. In this milieu the need for so called credible policies , existing financial instability and uncertainty have increased.

Turkey has been one of the critical examples of such cases, given its mini cycles of (speculative) expansion-fragility-crisis episodes over its post-capital account liberalization in late 1989. It is to this subject we now turn.

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concept can be unveiled. Krippner (2005:174), in line with Arrighi's The *Long Twentieth Century* defines it as a pattern of accumulation in which profits accrue primarily through financial channels rather than through trade and commodity production. According to Epstein (2005:3) "*financialization means the increasing role of financial motives, financial markets, financial actors and financial institutions in the operation of domestic and international economies*". In what follows, in a broader way, we can consider financialization as a phenomenon which can be described by increasing financial motives, volume and impact of financial activities within and among countries.

III. Central Bank of Turkey under Post-Capital Account Liberalization

Turkey has completed its financial liberalization with full deregulation of the capital account in August, 1989. Consequently, with the advent of elimination of controls on foreign capital transactions and the declaration of convertibility of the Turkish Lira in 1989, Turkey opened up its domestic asset markets to global financial competition. In this setting, **t**he Central Bank had to abandon its traditional instruments of monetary control and had become directly liable to the speculative conditions of financial arbitrage in the global markets.

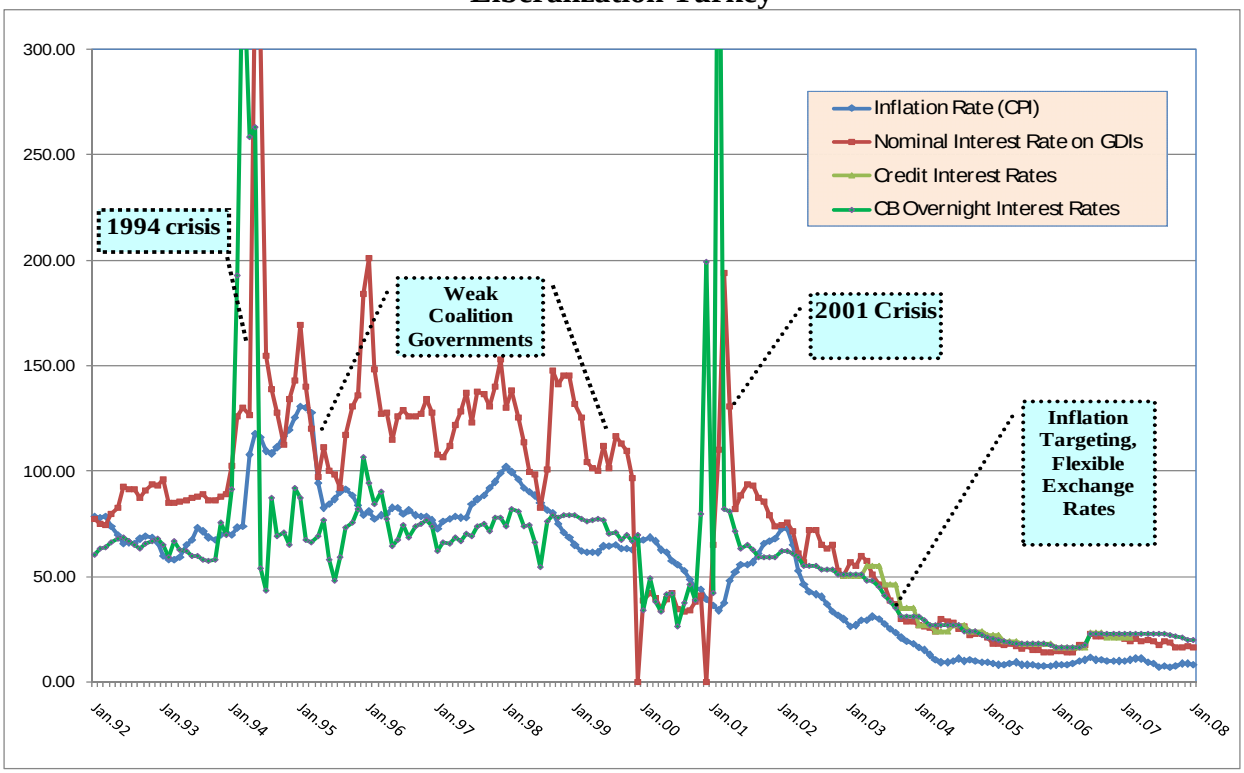
The immediate three year period after the 1989 reforms was marked with a virtual elimination of the "foreign exchange gap" which had crippled the Turkish macro balances for almost 4 decades. With the eruption of "hot money" inflows enabling abundant foreign exchange, Turkish commodity markets were all of a sudden flooded with cheap imports. Erratic movements in the current account, a rising trade deficit (from 3.5% of GNP in 1985-88 to 6% in 1990-93 and then again by 8% in 2000-2001) and a drastic deterioration of fiscal balances showed the unsustainability of the post-1989 model, with the eruption of severe financial crises of April, 1994 and February, 2001. In Boratav, Türel and Yeldan's (1995:22) words,

> "the post-1990 Turkish experience shows the serious problems confronting a developing economy which decides to move into full external and internal deregulation in the financial system under conditions of high inflation. The specter of capital flight becomes the dominant motive in policy-making and creates commitment to high interest rates and expectations for cheap foreign exchange. The links of these two policy variables with the real sphere of the economy, *i.e*. investment on physical capital and the current account balance of payments, are deeply severed. Instability in the rates of foreign exchange and interest rates creates feedbacks which lead the economy into further instability."

In Figure 1 below, we document the paths of consumer price inflation and the rates of interest on credit and the government's debt instruments (GDIs) along with the overnight (O/N) interest rate of the Central Bank following capital account liberalization. The turmoil following the currency crises of 1994 and 2001 are clearly visible. The rate of inflation which hovered around the plateau of 60-80% over the 1990s, finally could have been brought under control after 2003. Despite the positive achievements on the disinflation front, rates of interest remained slow to adjust. The *real* rate of interest remained above 15% through much of the post-2001 crisis era, and generated heavy pressures against the fiscal authority in meeting its debt obligations. The persistence of the real interest rates, on the other hand, had also been

conducive in attracting heavy flows of short term speculative finance capital over 2003 and 2006. This pattern continued into 2007 at an even stronger rate.

Figure 1. Consumer Price Inflation and Selected Interest Rates Under the Post-Financial Liberalization Turkey



Source: CBRT, www.tcmb.gov.tr

On the monetary policy front, the Central Bank of Turkey (CBRT) was granted its *independence* from political authority in October 2001. What follows, the central bank announced that its sole mandate is to restore and maintain price stability in the domestic markets and that it will follow an *implicit* inflation targeting until conditions are ready for full targeting. Thus, over 2002 and 2003 the CBRT targeted its "net domestic asset position" as a prelude to full inflation targeting. Finally in January 1, 2006 the CBRT has announced that it will adopt full-fledged inflation targeting. The Bank's current mandate is to set a "point" target of 5 percent inflation of the consumer prices. Given internal and external shocks, the Bank has recognized an internal (of 1 percent) and an external (of 2 percent) "uncertainty" band around

the point target. Thus, the Bank will try to keep the inflation rate at its point target; however, recognizing a band of maximum 2 percentage points below or above the 5% target rate. The Bank has announced that it will continue to use the overnight interest rates as its main policy tool to reach its target. It is stated explicitly that the "sole objective of the CBRT is to provide price stability", and that all other possible objectives are out of its policy realm.[10]

One of the earlier attempts to estimate an (implicit) monetary policy function of the CBRT is the seminal paper by Berument and Malatyali (2000). Using a generalized form of a Taylor-type reaction function over 1989.07 to 1997.03 Berument and Malatyali found that the CBRT has targeted M2Y growth, and that neither real nor nominal depreciation was sought for. They also report that, over the 1990s, the CBRT has *not* targeted currency issued, M2, net domestic assets, or net foreign assets, nor has taken any of the budget deficit measures into account while determining its monetary policy. A similar result was also deduced by Kaya (2006) where within a generalized Taylor form of monetary policy rule, Kaya reports that none of the conventional macro aggregates yield a statistically significant explanation of the behavior of the CBRT's short term interest rate over the post-1990 period.

The above results were put into a further test in Berument and Tasci (2004) where the authors suggest that over the 1990s the CBRT has actually used the *spread* between the interbank rate and the rate of nominal depreciation as its main policy rate, rather than the simple short term interest rate. Considering monthly data over 1990.01 to 2000.10, Berument and Tasci found that the CBRT responded to its foreign exchange reserves, output and M2 growth; and that it targeted neither the future, nor the lagged inflation rate. In other words, in the period immediate after capital account liberalization the CBRT was more concerned with stability of the markets rather than inflation.

Us (2004 and 2006) further studied alternative monetary rules for the CBRT under the inflation targeting regime using a small-scale macroeconomic model. She argues that in setting forward rules for macro stabilization, a monetary policy rule driven by a *monetary condition index* (MCI) is superior than a simple Taylor Rule framework; and that exchange rate is an important variable in driving the policy reaction function. US's (2006) results were contrasted in Karasoy, Kunter and Us (2006) who, utilizing a similar macroeconomic model, studied the

[10] Further institutional details of the Central Bank's inflation targeting framework can be found at the December 2005 document, "*General Framework of Inflation Targeting Regime and Monetary and Exchange Rate Policy for 200*6", available on line at http://www.tcmb.gov.tr/yeni/announce/2005/ANO2005-45.pdf

channels under which monetary policy is transmitted within an IT regime. Their results indicate that at a time of weak domestic demand, output gap has been seemingly less significant in determining inflation. Risk premium as measured by "*Embi+ Turkey*" was found to have a high explanatory power in shaping government borrowing rate and the exchange rate. However, Karasoy *et. al.,* found no direct relationship between primary surplus (as a ratio to the GNP) and inflation corroborating Kaya's (2006) results.

IV. Econometrics of Interest Rate Smoothing

Given the above background, we now turn our attention to the investigation of how the CBRT has reacted to changes in the economic conditions from 1994 to present. For this purpose, we will benefit from a central bank reaction function framework, which, in some senses can be likened to a modified version of the Taylor Rule (TR) which was first proposed by John Taylor in 1993. The initial idea behind the TR was that central banks could set their interest rates by following a simple formula based on inflation and output gaps**.** Later, Taylor himself and many others elaborated on this simple rule (Taylor 1999, Hebbel and Werner 2002; McCalum and Nelson 2004) and at a more general level, it provided the backbone of the new monetary policy (see among others, Romer, 2002, and Setterfield, 2006). In devising a TR-type monetary policy, Woglom (2003) directs our attention to the distinction between rules for *policy targets* and rules for *policy instruments*. While the former specifies "how the central bank will determine the value of its policy instrument such as the short term interest rate" (p. 200), the latter sets the broad objectives of monetary policy.

We thus hypothesize that a TR framework can be used to capture the changes in the responsiveness of the CBRT to different macroeconomic variables in its conduct of monetary policy. Before taking further steps, however, it has to be noted at the outset that we do not claim that the Turkish Central Bank has *officially* followed a variant of the TR. In other words, we do not aim at finding or disclosing a specific TR for the Turkish economy. Rather, our direct purpose is to check, *ex post*, which explanatory variables were significant in explaining the historically observed behavior of the Bank's interest rate from 1994 to the end of 2007. Hence our method joins the above authors in its usage of the Taylor rule, in that, rather than using it as a f*orward rule* in setting the interest rate policy, we will utilize it to elucidate the CBRT's

responses to changes in macroeconomic variables from 1994-2007. Furthermore, as we discuss below our reaction function specification is broader than the standard Taylor Rule type specifications.

IV-1. Data and Periodization

The period of our econometric analysis covers monthly observations on various macro prices and aggregates from July 1994 to December 2007. Different specifications of the following simple dynamic Ordinary Least Square (OLS) equation were implemented to investigate which variables had been significant in explaining the monetary policy behind the interest rate. Our main model runs as follows:

$$R_t = \alpha_0 + \alpha_1 R_{t-1} + \alpha_2 \pi_{t-1} + \alpha_3 ygap_{t-1} + \alpha_4 dept_{t-1} + \alpha_5 fr_{t-1} + \varepsilon_t$$

where, R_t (R_{t-1}) stand for nominal short term interest rate at time *t* (*t-1*); π_{t-1} for inflation rate at time t-1; $ygap_{t-1}$ for income gap at t-1; $rdept_{t-1}$ for nominal exchange rate depreciation at time t-1; and fr_{t-1} for the federal reserve rate (US interest rate) at time t-1

The above model can be seen as an *augmented TR* equation. Some models use *real* interest rates as dependent variables instead of nominal rates. Although this method could be used, we think using nominal interest rates is much more relevant because changes in nominal interest rates are genuine responses of central banks given the fact that they cannot directly control the real rates. We specifically used overnight interest rates because it has been the Bank's main policy instrument. The CBRT started using its overnight (O/N) interest rate as the main policy instrument after 2002. However, the Bank used to maneuver its overnight rates actively in the preceding period as well. In fact, given the fact that the CBRT abandoned its regulatory controls on the capital markets after the onset of deregulation, the Bank's overnight interest rates had always been an important indicator of its monetary policy even before 2002.[11] However, there exist different overnight interest rate data such as "selling" and "buying" rates. To obtain a single data set on the O/N rates, we used weighted averages of the realized interest

[11] As Aksoy and Leon-Ledesma (2005:6) points out "even if monetary aggregates or short term interest rates are not used operating targets these can be used as indicator variables if these contain useful information …."

rate data obtained from the Bank's data sources. Furthermore, as can be seen from Figure 1 above, the interest rates display abnormal hikes around April 1994, December 2000, and February 2001 which are the period of severe financial turbulences.[12] In what follows we excluded four observations in 1994, one in 2000 and one in 2001 from our data in order to avoid facing outlier effects.

For inflation we used annual changes in the Consumer Price Index (CPI) as reported by the Turkish Statistics Institute (Turkstat). However, we utilize the targeted inflation minus expected inflation at time t as the inflation variable for the *implicit* inflation targeting period (post-crisis 2002 – 2006) as well. The CBRT started announcing only one annual target for the end of the year after 2002. To convert the end-of-year inflation target into monthly segments, we created monthly series by using a linear transformation based on linearly gradual decreasing gap between previous year's inflation target and the current year's inflation target. Given that the central banks would tend to raise interest rates to curb inflationary pressures, if the expected inflation rate is greater than the targeted inflation rate, the expected sign of the inflation coefficient is negative.

In order to account for the output gap, we used the GDP data (calculated from the production side with constant 1987 prices). To obtain the GDP gap we created a production index. To solve the seasonality problem we first used the X11 method and then obtained the potential GDP by using the classical *Hodrick-Prescott* filter. The expected sign of the coefficient is negative because a central bank is supposed to decrease its interest rates in response to higher GDP gap.

In most of the "simple" versions of the TR equations, only the inflation rate and income gap variables were commonly used as explanatory variables. In its more modern treatment the nominal interest rate in lag form has become a standard component of the TR equations which we regard as an indication of the interest rate smoothing practices of central banks. The expected sign of the coefficient of interest lag is positive under the hypothesis of *interest rate smoothing, i.e.* the central banks would maintain the sign of the past period R_t in setting their current rate. High responsiveness to the lagged interest rate and small coefficients of other

[12] Although, they go hand in hand after 2001, the realized overnight interest rate was higher before 2001.

variables in the reaction function can be seen important indicators of high interest rate smoothing (Sack and Wieland 1999).[13,14]

Ball (2000) argues that for open economies an exchange rate variable should also be included in the TR equations because central banks have to take developments in the exchange markets into account for their objectives. Indeed, movements in the exchange rate can be a very important determinant of the central banks' behavior especially in developing countries, where exchange rate volatility is high and can even threaten financial stability. Central banks may have to prevent exchange rates from depreciation via increasing their interest rates in an attempt to counter the pass-through effects of higher foreign prices on domestic inflation. Thereby, the expected sign of the depreciation coefficient is positive.

Furthermore, it can be argued that foreign rates of interest are also important in affecting the behavior of financial agents in open economies which in turn can affect the develop,ng country central banks' policy responses. We thus included the Federal Reserve's policy interest rates (short-term overnight interest rates) mainly to capture such international arbitrage effects.[15] It is expected that an increase in the FED's interest rate would typically generate a signaling effect and would lead to a higher interest rate in a small, open economy. Thereby, the expected sign of the coefficient of the world interest rate variable is positive.

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[13] A similar method to check the interest rate smoothing tendency of central banks is used by Orphanides and Wieland (1998).

[14] Some authors used a different method to analyze interest rate smoothing (see Judd and Rudebusch 1998, Drew and Plantier 2000, Woodford 2003. This method can be summarized as follows

$$R_t - R_{t-1} = \theta(R_t^* - R_{t-1}) + \vartheta\,(R_{t-1} - R_{t-2})$$

$$R_t = (1-\theta)R_{t-1} + \theta R_t^* + \vartheta\,(R_{t-1} - R_{t-2})$$

$$R_t^* = r^* + \alpha_0(\pi_t - \pi_t^*) + \alpha_1\,(ygap_t) + \sum_{i}^{n} \alpha_n V_t$$

Where R_t nominal interest rate, R_t^* desired real interest rate, π_t inflation rate, π_t^* targeted inflation rate, $ygap_t$ the difference between actual and potential income, V_t vectors of variables which can be considered important for a central bank's decision making procedure. Here, $(1-\theta)$ indicates the interest rate smoothing of a central bank. Although this method is very appealing because of its partial adjustment nature and easiness we do not prefer to use this method. Because, this method assumes that there are desired interest rates which can be obtained from a Taylor type of reaction function. However, first, in general, central banks may not have desired interest rates in their mind. Second, even if they have desired rates in their mind we do not believe that a central bank reaction function can give us these desired rates. Because it requires that a central bank's decisions are mostly driven by a Taylor type framework. As we pointed out we only want to use a reaction function to assess the sensitiveness of a central bank to different macroeconomic indicators. And, as opposed to those who used this method we do not start with a claim that central banks significantly utilize a Taylor type of monetary Rule in their decision making procedure.

[15] Sinclair (2005) also uses the Federal Reserve rate to check the impact of foreign interest rates .

Similarly, it can be claimed that the current account balance and unemployment rate can exert influence on central bank's decision. However, depreciation and income gap variables traditionally lead to strong proxies respectively for variables accounting for the current account deficit and unemployment. Additions of these variables into the augmented TR equation inevitably may lead to econometrics problems such as multicollinearity. Hence, we excluded them from our analytical equation above.

We used explanatory variables in lag forms The logic behind this rests on the observation that the information about the current main macroeconomic indicators especially about the inflation rate and income gap is available to the central banks only in lagged fashion. Furthermore, using lag form may prevent us from facing endogeneity problem which may distorts the result significantly. [16]

IV-2. Regression Results

We first checked different regression specifications for the whole period by using the Ordinary Least Squares method with the Newey-West procedure in order to dissect possible problems of heteroscedasticty and autocorrelation.[17]

In the literature, Taylor type of regression results have been criticized because of the ignorance of the stability of the variables used in the regressions Osterholm (2003). Hence, before running regressions we checked if variables have unit root problems. However, unit root tests notoriously demonstrate lack of statistical power. So, we employed three different unit root tests for the whole period and sub-periods to decide if our variables suffer from unit root problems. Specifically, these tests are: Agumented Dickey Fuller (ADF), Philips Perron (P-P) and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test statistics. We considered a variable has a unit root problem if, at least, two of the tests indicate existing of unit root problem. Results can be seen in Table 1. For the whole period, ADF and P-P tests suggest that the "Federal Reserve rate" variable has unit root problem. On the other hand, although, none of the variables have unit root problem in the first sub-period (1994-1999) the "the interest rate", the "Federal

[16] Many studies which used current values of these variables have been criticized on the ground that central banks do not have the data concerning some variables like inflation rate until at the end of the month.

[17] We first started without any correction of heterosclasticity and autocorrelation. However, in most cases we faced unknown characteristics of heterosclaticity and autocorrelation problems. Hence, it seems to be reasonable to use Newey-West procedure not to bother about these econometric problems.

Reserve rate", and the "targeted-expected inflation" variables have unit root problems in the second sub-period (2002-2007).

We utilized three different estimation strategies to avoid falling to the trap of spurious regression problem whenever we have a unit root problem. This can also enable us to have a more robust picture of the Bank's interest rate policy. First we run regressions by using levels of all variables as if none of them has unit root problem. Second, we used the differences of the variables, which have unit root problems, with the levels of other variables in the regression. In this case, the coefficients of the variable used in difference form can be interpreted as a short-term, rather than long-term relationships. Using levels and differences in a regression may not be regarded ideal; hence, we also run a regression by using the differences of the all variables. This makes the interpretation of the coefficients a bit more complex than that of in the regressions with levels.[18] However, several different studies used changes of the variables to assess central banks' interest policy. For example, Sinclair (2005) utilizes this strategy to investigate the relationship between the changes in a set of macroeconomic variables and the change in interest rate policy in developing countries. And, as we pointed out, this can give us a more robust picture.

Columns 1 and 2 in Table 2 display the results of the regressions with levels for the entire period (1994-2007). The "inflation" and "interest rate" variables are significant at 1 percent significance level in the first specification. As can be seen in Column 2, when we add the "Federal reserve rate" and "depreciation" variables, the "depreciation" variable became significant at 1 per cent significance level as well. This result did not change when we used the change of the "Federal reserve rate" (see column 3). Table 3 displays the results for the entire period when we use changes instead of levels of all variables. The coefficient of change in interest rate continues to be significant at 1 percent, while the coefficient of change in inflation variable is significant at 5 percent level.[19] Furthermore, the negative sign of the coefficients of change in inflation and change in interest rate means that the Bank had a tendency to decrease the difference between the current and previous interest rates in response to increase in the change of lag interest variable and inflation variable. In fact, as we will see later, this result is

[18] In this case, all coefficients should be interpreted as indicators of short-term relationships.
[19] Coupled with these results, a very low R-squared means that this specification may not have high explanatory power in explaining the variation in central bank's interest rate change policy.

dominated by high levels of interest rates in the first period (1994-1999) rather than the second period.

The most obvious factor affecting the CBRT's interest rate behavior seems to be the direction of the preceding period's interest rate if we treat the era spanning from 1994 to 2007 as one single period. The CBRT seems to be unresponsiveness to change in the national income. Inflation and the depreciation of exchange rates seem to be among determinants of interest rate policy of the Bank although relative size of the coefficients of these variables are very small compared to the interest rate smoothing coefficient. Indeed. The low coefficients of other variables are among the indicators of interest rate smoothing.

However, we prefer to abstain from making generalizations of these results for the whole period given that there had been significant structural shifts over 1994 to 2007. As discussed above, the Turkish economic history sustained important turning points in 1998/99 and then again in 2001. In both of these years there had been significant changes in the monetary policy rules of the CBRT in determining its interest rate policy. First among these is the *standby agreement* signed in December 1999 between the Turkish government and the IMF. According to this agreement, the CBRT started to implement an inflation fighting strategy mainly based on nominal exchange rate anchoring. This program collapsed in February 2001 as a serious crisis erupted as triggered by massive capital outflows. The CBRT had to abandon its exchange rate based disinflation programme and accepted a huge depreciation of the Lira. After the crisis, the CBRT's institutional structure had been changed significantly. The bank's independence was granted and the bank began to follow a "implicit" inflation targeting regime with a flexible exchange regime in line with IMF's advice in January 2002. Hence, January 2002 can be considered another turning point which might affect the Bank's interest rate setting policy.[20]

Thereby, ideally, we should divide our whole sample into three sub-samples namely 1994-1999, 2000-2001 and 2002-2007. However, the very small number of the degrees of freedom may cause high standard deviation and, in turn, lead to insignificant coefficients even if the explanatory variables would have some role in determining the Bank's interest rate. Furthermore, autocorrelation and unit root problems may exacerbate the situation. Therefore,

[20] The classical Chow Test results also validate the structural changes over these periods. However, they are not very reliable. Even so, significant institutional and policy changes at the beginning and at the end of these periods suggest that our partitioning is reasonable. And, this periodization is also useful for our purposes of understanding the impact of inflation targeting program on the Bank's interest rate setting policy.

we excluded the period of 2000-2001 from our analysis. In other words, we have mainly checked the Bank's interest rate policy in the two sub-periods namely, 1994-1999 and 2002-2007. It can further be argued that using lag inflation as an explanatory variable can be misleading to explain the behavior of a central bank under the inflation targeting regime because central banks generally may consider the deviation between targeted inflation rate and expected inflation rate when they implement an inflation targeting strategy. Hence, in the second period, we further checked whether our results would alter when we make use of the "*targeted* inflation minus *expected* inflation" as an explanatory variable instead of the lagged inflation rate

First, we will discuss the econometric results for the first sub-period. All variables are stationary in this period (see the Column 2 in Table 1). Hence, we will only use regressions with levels of the variables. The results of the regressions can be seen in Columns 1 and 2 in Table 4). As can be seen in Column 1, the only significant coefficients under the reduced form specification are the coefficients of the lagged interest rate variable and the constant term. None of the remaining variables are significant.[21] In this sense, interestingly, the Bank's interest rate does not seem to be responsive developments in important macroeconomic variables. According to these results interest rate smoothing has been the main determinants of the CBRT's interest rate policy in the period from 1994 to 1999.

Secondly, we will discuss the implicit inflation targeting period (2002-2007). As we pointed out before, we utilized two slightly different regression specifications for this period. First, we modeled a regression specification with the lagged inflation rate. Here, the interest rate and the Federal Reserve data have unit root problems order of 1. Column 1 and 2 in Table 5 display the regression results when we make use of the lagged interest rate as the inflation variable and using levels of all variables. It is very clear that there is a very strong interest rate smoothing tendency in this period. The constant term and the "lagged interest rate" are only significant variables in Column 1. When we add "depreciation" and "Federal reserve rate" variables to our base regression both variables turn out to be significant as well. However, the coefficient of "lag inflation rate" is very small with a "wrong" sign, although the pair wise correlation between lag inflation rate and interest rate indicates high positive correlation

[21] We also checked regressions by using differences. The results above did not change much. The only significant variable in interest rate lags at a 1 percent significance level when we utilize differences. .

between these two variables.[22] With very high R-squared these are perfect text book signs of multi co-linearity. To deal with multi co-linearity problem there are several suggested methods suggested in the literature, such as obtaining more data, formalizing relationships among regressors, dropping a variable, specifying a relationship among some parameters, etc (see, e.g., Kennedy 1998: 188). Dropping a variable is the most relevant strategy for us. When we exclude interest rate lag variable from the regression inflation lag variable became significant at 1 percent significance level with correct sign.

Furthermore, given the fact that we have unit root problems both in interest rate data and Federal Reserve rate data, the significance of Federal Reserve rate may be revelation of a spurious relation. In fact when we use the difference of the Federal Reserve Rate and that of the interest rates variable the results seem to support our suspicion. The coefficient of Federal interest rate is not significant in this specification (see column 5 in Table 5). These findings are supported by the regression specification with changes of all variables instead of levels. Table 6 indicates that the constant term and the coefficient of change in the lag depreciation rate are significant at 10 percent significance level, the coefficient of change in lag interest rate and lag inflation are significant at 1 percent significant level.[23]

To summarize our results with the lag inflation variable for the period of 2002-2007, the most robust findings are that the Bank's interest rate smoothing tendency remains as the main determinant of its interest rate policy in this period. In this sense, larger lag interest rate coefficients compared to the preceding period suggest that interest rate smoothing has become an even more important consideration under the new regime. The Bank's response to inflation seems to be also an important factor which is in line with the inflation targeting regime. Furthermore, surprisingly depreciation seems to be one of the considerations even under flexible exchange rate regime although the magnitude of the related coefficient is not very big.

As we pointed, we also run a set of regressions by utilizing expected inflation minus targeted inflation as the explanatory inflation variable instead of lag inflation variable to be able to capture the possibility that central banks may be concerned more with the difference of the

[22] The pair-wise correlation between interest rate and lag inflation is 0.923 and the correlation between inflation and lag interest rate is 0.925. Hence, it is normal to assume the multi co-linearity is caused by the existence of lag interest variable with lag inflation rate. In other words, regression results may not differentiate the impact of lag inflation rate and lag interest rate on the Central Bank's policy.

[23] The positive sign of the coefficient of change in interest lag indicates that interest rate smoothing is much more apparent in this period which could be made possible by low levels and decreasing trend in interest rates in this period.

expected and the targeted inflation rates, as some of the inflation targeting literature suggests. When we look at results from a regression specification with levels, the coefficient of the interest rate smoothing is significant at 1 percent significance level and very high (see column 1 in Table7). As can be seen from column 2 in Table 7 depreciation and Federal Reserve rate variables are significant as well when we add them to the regression. However, unit root problems and multi-colinearity problems can distort these results. In fact, at a glance, we seem to have very similar problems as in the case of the preceding one. Lag inflation variable (targeted inflation variable minus expected inflation) is very small and has a wrong sign although the pair-wise correlation between inflation variable and interest rate is very high with a negative sign. Again, with a very high R-squared this is indicative of a multi co-linearity problem. So, we applied the same procedure as above. When we exclude the lag interest rate from the regression, the coefficient of lag inflation became significant at 1 percent level with an expected sign.[24] However, this result may not be robust because inflation, interest rate, and the Federal Reserve rate data have unit root problems. To address this issue we used the differences of the variables suffering from unit root problems. Results can be seen in column 4 Table 7. Under this specification, again, the interest smoothing variable is significant at 1 percent significance level. And the exchange rate depreciation variable is significant at 10 percent significance level although the coefficient of this variable is negligibly small. When we look at the results from the regression specification with the differences of all variables the picture did not change at all (see Table 8). Hence, for this case, the relationship between interest rates and inflation; interest rates and Federal Reserve rate are not robust.

Over the period 2002 to the end of 2007, whether we use the "lagged inflation rate" or the "expected minus the targeted inflation" as the relevant (explanatory) variable of "inflation", the most robust conclusion is that the Bank's interest rate smoothing tendency seemed to continue with an increasing magnitude and the Bank did not take developments in the business cycles into consideration in determining its interest rate policy. Surprisingly the lagged inflation, rather than the "expected minus targeted inflation rate" seems to be a robust determinant of interest rate decisions of the Bank. Furthermore, there is some econometric

[24] Furthermore, in this specification Federal Reserve rate is also significant at 10 percent level. But it has a wrong sign.

evidence that nominal exchange rate depreciation influences the Bank's interest rate policy, although the magnitude of the coefficient of this variable turns out to be very small.[25]

V. Conclusion

In this paper we studied how the interest rate policy of the Central bank of the Republic of Turkey (CBRT) has evolved over time under the post-financial liberalization and deregulation era. Utilizing econometric methods on a generalized form of a Taylor Rule we searched for the possible revelation of a variety of determinants of monetary policy with different objectives over 1994-2007. Our findings suggest that the lagged interest variable is the most robust significant variable under all specifications although the responsiveness of the Bank to some other macroeconomic indicators seemed to increase in the second period. Another most robust finding is that the income gap variable was not significant in any of our specifications. Hence, It can be argued that over such an extended time horizon during when significant shifts in the macroeconomic environment have occurred, the CBRT's almost exclusive focus on "interest rate smoothing" has not changed; and the Bank persistently ignored (or had to ignore) the developments in income gap in designing its interest rate policy. These results are statistically significant in all cases and in all periodizations and robust to a large range of different specifications.

It can be argued that in general, under the constraints of the global financial markets, The Turkish central bank was conditioned to following an *interest rate smoothing strategy* for at least three reasons. First of all, rising volatility along with associated uncertainty and fragility might make it almost impossible to determine the true picture of the economy. Secondly, related to the first, the Turkish Central Bank has several times only passively responded to shocks to the economy, as it probably was not "confident" about the outcomes of its policies (reaction of markets). Trying to keep interest rates constant for a sufficiently long time can thus be seen as a remedy against this self-acclaimed non-assurance and protecting so called credibility. Thirdly, even when the Bank correctly estimated the situation, its instruments might be ineffective, and

[25] We also checked the effects of *real* exchange rate depreciation instead of nominal exchange rate depreciation on the Bank's interest rate policy. It appeared to be fact that, robustly, the real depreciation seem to have a slightly higher impact on interest rates in the second period compared to nominal depreciation, whereas real depreciation is not significant in the first period.

could not change the direction of the economy. So, the Bank might surrender the pressure of domestic and international markets.

Given these structural constraints of financialization as such, we argue that with the advent of free capital mobility, CBs have lost their autonomy in deploying the exchange rate or the interest rate as strategic instruments for achieving objectives of growth, employment and macro stability. In an uncertain characterized by massive capital mobility, the alleged "independence" of the CBs means little beyond "ineptedness".

References

Aksoy Y. and Leon-Ledesma (2005), "Interest Rates and Output In The Long Run" , European Central Bank Working Paper Series, No:434.

Ball L (2000), "Policy Rules and External Shocks" *NBER Working Paper* No. 7910.

Batini, Nicoletta, Peter Breuer, Kalpana Kochhar and Skott Roger (2006) "Inflation Targeting and the IMF" IMF Staff Paper, Washington DC, March.

Benhabib J, Schmitt-Grohe and Uribe (2003), "Backward-Looking Interest Rate Rules, Interest Rate smoothing, and Macroeconomic Instability", *Journal of Money Credit and Banking* Vol.35, No:6.

Bernanke, Ben S., Thomas Laubach, Adam S. Posen and Frederic S. Mishkin (1999) *Inflation Targeting: Lessons from the International Experience.* Princeton, NJ: Princeton University Press.

Buiter, W. (2006) "Rethinking Inflation Targeting and Central Bank Independence" paper presented at the Turkish Economic Association Conference, Ankara, September.

Berument, Hakan and Kamuran Malatyali (2000) "The Implicit Reaction Function of the Central Bank of the Republic of Turkey" *Applied Economics Letters*, 7:425-430.

Berument, Hakan and Hakan Tasci (2004) "Monetary Policy Rules in Practice: Evidence from Turkey" *International Journal of Finance and Economics*, 9:33-38.

Boratav, Korkut, Oktar Türel and Erinc Yeldan (1995) "The Turkish Economy in 1981-92: A Balance Sheet, Problems and Prospects" *METU Studies in Development* 22(1): 1-36.

Brainard W (1967), Uncertainty and Effectiveness of Policy, *American Economic Review*, Vol 57, 411-425.

Caplin A and Leahy J (1996), "Monetary Policy as a Search Process", *American Economic Review*, 86(4), 689-702.

CBRT (December 2005), "The General Framework of Inflation Targeting Regime and Monetary and Exchange Policy in 2006" available on line at: *www.tcmb.gov.tr*.

Conway P (2000), "Monetary Policy in an Uncertain World" Bank of New Zealand Bulletin, Vol 63, No.3

Crotty, James (2007) "If Financial Market Competition is so Intense, Why are Financial Firm Profits so High? Reflections on the Current 'Golden Age' of Finance" Paper presented at the Conference on "Financialization: in retrospect and prospect" University of Manchester, February.

Cukierman A (1996), " Why Does the Fed Smooth Interest Rates" in Beleongia (ed), *Monetary Policy on the 75th Anniversary of Federal Reserve System*, Kluver Acedamic Publishers, Massachusetts

Drew A. and Plantier C.L. (2000), "Interest Rate Smoothing in New Zealand and Other Dollar Bloc Countries" , Reserve Bank of New Zealand Discussion Paper Serious No:2000/10.

Epstein, Gerald (Ed) (2005) *Financialization and the Global Economy*, Edward Elgar Press.

Epstein, G. and E. Yeldan (2008) "Inflation Targeting, Employment Creation and Economic Development: assessing the Impacts and Policy Alternatives" *International Review of Applied Economics*, 22(2): 131-144.

Goodhard (1998), "Central Bankers and Uncertainty", Keynes Lecture to the British Academy.

Grabel, Ilene (1995) "Speculation-Led Economic Development: A Post-Keynesian Interpretation of Financial Liberalization Programmes in The Third World" *International Review of Applied Economics* 9(2): 127-149.

Greenspan A (2003), " Monetary Policy Under Uncertainty", Speech at a symposium sponsored by the Federal Reserve Bank of Kansas City, Jackson Hole, Wyoming.

Hebbel S. and Werner A. (2002), "Inflation Targeting in Brazil, Chile and Mexico: Performance, Credibility, and the Exchange Rate" Central bank of Chile, Discussion Paper.

Judd J. P. and Rudebusch D.G (1998), "Taylor's Rule and the Fed: 1970-1997", FRB of San Francisco Economic Review No: 3.

Karasoy, Almila, Kursat Kunter and Vuslat Us (2006) "Monetary Transmission Mechanism in Turkey Under Free Float Using A Small-Scale Macroeconomic Model" Central Bank of the Republic of Turkey, Ankara, *mimeo*.

Kaya, Demet (2006) "Turkish Central Bank Monetary Policy" Bilkent University, Unpublished MA Thesis, February.

Kozicki S (1999), "How Useful are Taylor Rules for Monetary Policy ?, Federal. Reserve Bank of Kansas City Economic Review, vol. 84, 5-33

Krippner (2006), "The Financialization of the American Economy", Socio-Economic Review,No:3, 173-208

Lowe P and Ellis L (1998), "The Smoothing of Official Interest Rates", In Lowe P. (ed). *Monetary Policy and Inflation Targeting*, Sydney: Reserve Bank of Australia.

Mccalum and Nelson (2004), "Targeting vs. Instrument Rules for Monetary Policy" *NBER Working Papers* No. W10612.

McKinnon, R. (1973) *Money and Capital in Economic Development*, Washington DC: Brookings Institution.

Mehra Y (2001), "The Taylor Principle, Interest Rate Smoothing and Fed Policy in the 1970s and 1980s", Federal Reserve Bank of Richmond, Working Paper No 01-05.

Mishkin, Frederic S. and Klaus Schmidt-Hebbel (2001) "One Decade of Inflation Targeting in the World: What Do We Know and What Do We Need to Know?" *NBER Working Papers*, No 8397, July. *(www.nber.org/papers/w8397*)

Orphanides A and Wieland V and (1998), "Price Stability and Monetary Policy Effectiveness when Nominal Interest Rates are Bounded at Zero, Finance and Economic Discussion Series, No.35. Board of Governors of the Federal System.

Osterholm, P. (2003), "The Taylor rule: a spurious regression?" Working Paper 2003:20, Department of Economics, Uppsala University

Romer, P. (2002), "Keynesian Macroeconomics without LM Curve", *Journal of Economic Perspectives*, Vol 14, No:2, 149-169

Sack, B. (1998a) "Does the Fed Act Gradually? A VAR Analysis." Board of Governors of the Federal Reserve System. Finance and Economics Discussion Series, 98–17.

Sack, B. (1998b) "Uncertainty, Learning, and Gradual Monetary Policy." Board of Governors of the Federal Reserve System. Finance and Economics Discussion Series, 98–34.

Sack, B. and V. Wieland (1999) “Interest-Rate Smoothing and Optimal Monetary Policy: A Report on Recent Empirical Evidence.” Board of Governors of the Federal Reserve System, *mimeo*.

Setterfield, Mark (2006) “Is Inflation Targeting Compatible with Post Keynesian Economics?” *Journal of Post Keynesian Economics*, 28 (4): 653-671.

Shaw, E.S. (1973) Financial Deepening in Economic Development, New York: Oxford University Press.

Sinclair, P. (2005) “ The Transmission of Monetary Policy Through Interest Rates” , in *How Monetary Policy Works* (edited by Mahadava and Sinclair), Routledge, New York.

Stiglitz, Joseph (2002) “Financial Market Stability and Monetary Policy” *Pacific Economic Review* 7(1):13-30.

Stiglitz, Joseph (2000) “Capital Market Liberalization, Economic Growth and Instability” *World Development*, 28(6): 1075-1086.

Swensson, L. (2002), “What is Wrong With Taylor Rules? Using Judgement in Monetary Policy Through Targeting Rules” *National Bureau of Economic Research* Working Paper 9421.

Taylor, J. (1993), “Discretion versus Policy Rules in Practice”, Carnegie-Rochester Conference Series on Public Policy 39 pp 195-214.

Taylor, J. (1998), “A Historical Analysis of Monetary Policy Rules”, *NBER Working Paper*, No 6768.

Us, Vuslat (2006) “Alternative Monetary Policy Rules in The Turkish Economy under Inflation Targeting Framework” Central Bank of the Republic of Turkey, Ankara, *mimeo*.

Us, Vuslat (2004) “Monetary Transmission Mechanism in Turkey under Monetary Conditions Index: An Alternative Policy Rule”, *Applied Economics*, 36:967-976.

Woglom, Geoffrey (2003) “How Has Inflation Targeting Affected Monetary Policy in South Africa?” *The South African Journal of Economics*, June, pp. 198-210.

Woodford, M. (2001) “The Taylor Rule and Optimal Monetary Policy," *American Economic Review*, Papers and Proceedings 91, 232-37.

Woodford M. (2002) “Optimal Interest Rate Smoothing”, *Review of Economic Studies*, Vol. 70 Issue.4, 861-886 .

Woodford, M. (2003) *Interest and Prices*, Princeton University Press, Oxford and Princeton.

Table 1: Unit Root Results (* Indicates unit root problem)

	1994-2007			1994-1999			2002-2007		
Variables	ADF	P-P	KPSS	ADF	P-P	KPSS	ADF	P-P	KPSS
	t Stat	Adj t Stat.	LM Stat.	t Stat	Adj t Stat.	LM Stat.	t Stat	Adj t Stat.	LM Stat.
R_{t-1}	-3.450	-5.021	0.190	-5.007	-4.976	0.038	-1.926*	-1.463*	0.284*
π_{t-1}	-1.587*	-3.886	0.091	-3.420	-3.112*	0.080	-6.917	-5.790	0.264
$ygap_{t-1}$	-4.851	-5.077	0.04	-4.210	-4.228	0.139	-2.982*	-3.213*	0.050*
fy_{t-1}	-1.874*	-1.602*	0.51	-3.842	-3.690	0.205		-1.529	
$depr_{t-1}$	-8.609	-8.871	0.045	-6.149	-5.994	0.243	-6.228	-5.925	0.095
Tar-expec inf							-2.761*	-2.750*	0.149*

ADF:Agumented Dickey-Fuller Test Statistics, P-P: Philips-Perron Test Statistics ,KPSS: Kwiatkowski-Phillips-Schmidt-Shin Test Statistics

Null Hypothesis of ADF and P-P: Variable has a unit root , Null Hypothesis of KPSS: Variable is Stationary

Table 2: Regression Results (1994-2007)

(* refers significance at 1 percent significance level. ** refers significance at 5 percent significance level, *** refers significance at 10 percent significance level)

	1		2		3	
Variables	Coefficient	Std. Error	Coefficient	Std. Error	Coefficient	Std. Error
C	3.265*	1.133	3.662**	1.830	4.605*	1.534
R_{t-1}	0.782*	0.062	0.753*	0.073	0.716*	0.083
π_{t-1}	0.142*	0.043	0.151*	0.051	0.173*	0.052
$ygap_{t-1}$	-0.159	0.191	-0.126	0.179	-0.174	0.204
fr_{t-1}			0.038	0.345		0.078
Δfr_{t-1}					-6.701	5.006
$depr_{t-1}$			0.168***	0.092	0.171**	0.078
R-squared	0.903		0.904		0.906	
F	473.839*		283.030*		288.202*	

Table 3: Regression Results with differences (1994-2007)

	1		2	
Variables	Coefficient	Std. Error	Coefficient	Std. Error
C	-0.600	0.6274	-0.592	0.640
ΔR_{t-1}	-0.273*	0.0949	-0.283*	0.097
$\Delta \pi_{t-1}$	- 0.370**	0.1912	-0.342***	0.186
$\Delta ygap_{t-1}$	-0.465	0.3330	-0.437	0.328
Δffr_{t-1}			2.463	3.451
$\Delta debt_{t-1}$			0.134	0.087
R-squared	0.112		0.120	
F	6.296*		4.035*	

Table 4: Regression Results (1994-1999)

	1		2	
Variables	Coefficient	Std. Error	Coefficient	Std. Error
C	43.249*	11.898	52.184**	26.29
R_{t-1}	0.440*	0.153	0.397*	0.167
π_{t-1}	-0.024	0.046	-0.005	0.051
$ygap_{t-1}$	-0.447	0.326	-0.439	0.395
ffr_{t-1}			-1.736	3.742
$debt_{t-1}$			0.428	0.581
R-squared	0.238		0.248	
F	6.447*		3.958*	

Table 5: Regression Results (2002-07)

	1		2		3		4		5	
Variables	Coefficient	Std. Error	Coefficient	Std. Error	Coefficient	Std. Error	Coefficient	Std. Error	Coefficient	Std. Error
C	0.49	0.46	-1.24*	0.58	19.46*	2.26	-0.49	0.47	0.16	0.18
R_{t-1}	0.96*	0.04	1.02*	0.04			0.97*	0.01		
ΔR_{t-1}									0.36*	0.09
π_{t-1}	-0.001	0.03	-0.03	0.03	0.67*	0.08			-0.03*	0.01
$ygap_{t-1}$	-0.05	0.03	-0.02	0.03	0.12	0.22	-0.01	0.03	-0.03	0.03
ffr_{t-1}			0.29*	0.07	-2.00*	0.42	0.21*	0.08		
Δffr_{t-1}									-0.13	1.17
$depr_{t-1}$			0.11*	0.03	0.11*	0.11	0.11*	0.03	0.10*	0.03
R-squared	0.994		0.996		0.910		0.996		0.548	
F	3903.00*		3068.82*		162.53*		3737.99*		15.04*	

Table 6 (2002-2007) Differences

Variables	Coefficient	Std. Error	Coefficient	Std. Error
C	-0.207***	0.116	-0.201	0.139
ΔR_{t-1}	0.339*	0.125	0.369*	0.125
$\Delta\pi_{t-1}$	0.214*	0.050	0.209*	0.054
$\Delta ygap_{t-1}$	0.069	0.050	0.077	0.049
Δfr_{t-1}			0.124	0.978
$\Delta dept_{t-1}$			0.048***	0.027
R-squared	0.480		0.512	
F	19.703		12.998	

Table 7 (2002-07) Expected Inflation Introduce Edildi

Variables	*Coefficient*	*Std. Error*	*Coefficient*	*Std. Error*	*Coefficient*	*Std. Error*	*Coefficient*	*Std. Error*
C	*0.309*	*0.380*	*-0.768*	*0.387*	*29.614**	*4.735*	*-0.354***	*0.168*
R_{t-1}	*0.968*	*0.022*	*0.987**	*0.017*				
ΔR_{t-1}							*0.514**	*0.089*
$E\pi_t - \pi_t^T$	*0.032*	*0.050*	*0.042*	*0.042*	*-1.312**	*0.206*		
$\Delta(E\pi_t - \pi_t^T)$							*0.048*	*0.086*
$ygap_{t-1}$	*-0.057*	*0.035*	*-0.025*	*0.032*	*0.418*	*0.419*	*-0.031*	*0.032*
fr_{t-1}			*0.218**	*0.075*	*-2.569***	*1.078*		
Δfr_{t-1}							*0.939*	*1.111*
$dept_{t-1}$			*0.109**	*0.028*	*-0.010*	*0.246*	*0.073***	*0.032*
R-squared	*0.995*		*0.996*		*0.642*		*0.433653*	
F	*3967.031*		*3058.689*		*28.646*		*9.494689*	

Table 8 (2002-2007) Differences

Variables	Coefficient	Std. Error	Coefficient	Std. Error
C	-0.330**	0.143	-0.374**	0.176
ΔR_{t-1}	0.531*	0.101	0.538*	0.103
$\Delta \pi_{t-1}$	0.12	0.107	0.119	0.110
$\Delta ygap_{t-1}$	0.069	0.056	0.075	0.052
Δfr_{t-1}			0.984	0.923
$\Delta debt_{t-1}$			0.049***	0.029
R-squared	0.385		0.425	
F	13.345		9.1734	